INTRODUCTION

Central to the problem of effectiveness of communication is the communication of effective verbal behavior of people in dangerous and confined environments, i.e. cockpit communication. The transmission of information during long-term communication is crucial for mission success, both regarding the in-group, onboard, communication and communication between the crew and the MCC. This study aims to explain verbal communication evolvement of crew members of both genders whilst a long-lasting isolation as a simulation of a flight situation. In respect to that, data from such scientific disciplines like linguistics, psycholinguistics, psychology, and biochemistry will be described together to prove/reject the hypothesis outlined here below. This interdisciplinary approach is an innovative method of noninvasive practice in the field of communication research.

However, there have been a number of studies dedicated to verbal behavior of people in dangerous and confined environments, i.e. cockpit communication [1] analysed psycholinguistically in line with the research of the Russian Academy of Sciences Institute for Biomedical Problems (IMBP) on communication patterns with focus on discourse and semantic analysis of isolated crews for space missions [2]. Additionally, the problem of effectiveness of team communication is being thoroughly investigated by the d.school at Stanford University in collaboration with SAP and Hasso-Plattner-Institute [3], [4]. Nevertheless, the verbal behavior of people under stress has not been investigated from the biological perspective so far. Therefore, the present research builds a bridge between the existing research findings and proposes a biological, cognitive explanation of communication phenomena.

The psycholinguistic view on the issue of communication under stress is, though, an extremely developing approach in various sciences, i.e. computer science. Accordingly, there is a publication on the application of psycholinguistics for improvement and enrichment of AI capacity [5] which was presented on an annual international conference on Biologically Inspired Cognitive Architectures (BICA 2017).

Hypothesis Information: In accordance with the coping theory [6] and the previous experiments, e.g. [7], [8], [9], there are various human types to deal with a stress situation, differing, firstly, with respect to their physical reaction (i.e. ACTH hormones level [10] etc.) and, secondly, considering their values, consequently, psychological apprehension of stress in life in general (primarily conducted by the Institute for Biomedical Problems (Moscow), i.e. [2]).

Study Interest: The interest of the present study is based on the linguistic behavior of the female and masculine subjects with diverse cultural background in a small group (6 to 9 persons), who show different psychological constellation patterns, while being exposed to relative equal stress of a long-term isolation. The isolation of 4-month in an on Earth chamber (Moscow, IMBP) is a simulation of a long-term space flight, i.e. to the Moon and Mars, of an international crew.

Hypothesis: Since there are empirically proved diverse psychological coping strategies to stress conditions, we aim to examine the cognitive-psychological outcomes over the cognitive-linguistic ones.

According to some studies, humans are highly dependent on their emotional state [11] and personal traits when communicating verbally; especially speaking in a foreign language due to additional cognitive load. Therefore, it is expected that in line with the psychological coping of stress, the linguistic performance could also be grouped regarding different psycholinguistic personal traits. Hence we anticipate a correlation of the psychological and linguistic coping strategies. This assumption underlies a shared cognitive basis of both mental activities.

Considering the linguistic behavior in a frame of the current study we divide it into formal and functional, where the formal ones are “linguistic pure” (i.e. grammar, speech speed, word choice etc.) and the functional ones reveal psycholinguistic ones (i.e. information sharing, initiation etc. [1]).

Relevance: Estimated linguistic coping strategies will enrich noninvasive methods for emotional state appraisal of crew members imposed on every possible kind of stressors during a space flight, especially a long-term one and which consists of multinational crew members. Further the study results will contribute to harmonization of in-group communication dynamics and increase group communication efficiency through a deeper understanding of a nature of human verbal behavior in extreme and confined environments.
Experiment frame: As background information for the psycholinguistic experiment will serve the following personal data of each crew member: educational level and obtained profession, experience in space missions, knowledge of further (foreign) languages, if applicable – linguistic eloquence, and intercultural experience.

Data prior to the experiment. Psychological tests on predominant personal values, frustration, and stress coping strategies will be a baseline prior to the isolation experiment. In case a lingua franca is a foreign language for one of the crew member, the level of his/her fluency in the respected language must be measured. Additionally, the level of stress hormones, like cortisol, testosterone and alpha-amylase, pulse, and respiratory rate in a stress-free environment must build a biochemical baseline of each crew member for further analyses of physiological stress state (“individual coping portrait”).

4-month isolation. During the 4-month isolation, conducted in Moscow at IMBP and which serves as an analog of a space flight, communication patterns of crew members will be analyzed by observing their in-group discussions and mutual problem solving. Their linguistic performance will be analyzed in percentual manner regarding the physical stress response indicated by respiratory rate, stress hormones in salvia etc. By the percentual character of the linguistic performance we understand quantity of formal or functional deviants by each crew member under stress condition of different extent.

Expectations: The isolation period will be roughly divided into 4 phases according to the previous psychological studies on the behavior of people in confined environments [2] and which we expect to have an impact on the verbal performance in the subjects. Therefore, firstly, we anticipate a change in in-group communication dynamics and transformation of individual verbal performance due to the temporal evolvement of isolation stress – in-group linguistic adaptation. Secondly, linguistic adaptation characteristics, formal and functional, should depend on the individual psychological constellation and stress level – individual linguistic adaptation.

Conclusion and future work: Thus, we aim to describe and classify linguistic adaptation patterns during different stages/levels of stress. This will contribute to noninvasive methods for emotional stress appraisal and enable to propose alternative approaches to improve in-group communication and overall sociometrical indexes. The latter will lead to an increase in creativity performance because of greater group cohesion.

Establishing psycholinguistic patterns of the reaction on stress depending on the biological and psychological individual variables, we will also enhance the existing methods of education, particularity those of astraunauts and cosmonauts. Moreover the outcomes of the study should be applicable to other situational communication contexts.

References: